

REMARKS

Claims 1-11 and 24-37 are unchanged and remain pending in the present application. Applicant would like to thank the Examiner and the Examiner's Supervisor for the courtesies extended to applicant's representative during a telephone interview on December 23, 2008. During that interview, the Examiner explained how he was interpreting the applied references in view of the pending claims. Arguments made by the applicant's representative during the interview are set forth below. Although agreement was not reached at that time, applicant believes these arguments traverse the Examiner's rejections. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103

Claims 1, 6, 8-11, 24, 29, 31, 32, and 34-37 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Murai (US 6,705,708) ("Murai '708") in view of Qiu et al. (US 6,402,304) ("Qiu"); Cheng et al.: Thin Solid Films, Vol. 385, Issues 1-2, April 2001, pp. 5-10, Thickness-dependent microstructures and electrical properties of PZT films derived from sol-gel process ("Cheng"); and Sumi et al.: Thin Solid Films, Vol. 315, Issues 1-2, March 1998, pp. 77-85: Effect of the annealing temperature on structural and piezoelectric properties of the sol-gel Pb(Zr 0.56Ti 0.44) 0.90 (Mg 1/3 Nb 2/3) 0.10 O₃ films ("Sumi"). Applicant respectfully traverses this rejection.

First, Murai does not disclose that "the layered piezoelectric film is made of rhombohedral or tetragonal perovskite oxide having preferred orientation along the (111) plane." The Examiner states that a layered piezoelectric film including a piezoelectric film

43a (corresponding to the first thin piezoelectric film of the present invention) and a piezoelectric film 43 (e.g., 6-layered, corresponding to the second thin piezoelectric film of the present invention) is oriented along the (111) plane. However, it is actually oriented along the (100) plane. Specifically, Murai merely discloses that the layered piezoelectric film is made of rhombohedral or tetragonal perovskite oxide having preferred orientation along the (100) plane, but does not disclose that “the layered piezoelectric film is made of rhombohedral or tetragonal perovskite oxide having preferred orientation along the (111) plane.”

Actually, Murai discloses that “the piezoelectric film 43 formed on a Ti layer (nucleus) from which the piezoelectric film 43a is removed is made of rhombohedral or tetragonal perovskite oxide having preferred orientation along the (111) plane.” However, this only means that “the piezoelectric film 43 (corresponding to the second thin piezoelectric film of the present invention) is made of rhombohedral or tetragonal perovskite oxide having preferred orientation along the (111) plane.” That is, Murai fails to disclose that “the layered piezoelectric film is made of rhombohedral or tetragonal perovskite oxide having preferred orientation along the (111) plane.”

Second, the outstanding Office Action alleges that Cheng teaches “the columnar grains of the second thin piezoelectric film have a larger average cross-sectional diameter than the columnar grains of the first thin piezoelectric film.” During the interview, applicant specifically requested that the Examiner explain how this reference was being interpreted to meet this claim limitation. The Examiner was unable to point to any particular teaching in the Cheng reference or otherwise provide a satisfactory explanation of this point. In fact, Cheng appears to teach that the grains are

homogeneously distributed (e.g., see 1st sentence of Section 3.1) and thus teaches away from the Examiner's interpretation of this reference. In addition, as argued in previous responses, none of the relied upon references teach this aspect of applicant's claimed invention. For at least this reason, the current rejections are deficient and should be withdrawn.

In Murai, the piezoelectric film 43 and the piezoelectric film 43a are formed by the same method. Therefore, the grain diameter of the films would be the same. Even if Cheng or one of the other secondary references were combined with Murai, the grain diameters in the two layers would be controlled to same size. In other words, there is no teaching or suggestion that cross-sectional diameter of the grains in one piezoelectric film would be larger or of a different size than the other piezoelectric film. Thus, even the combined teachings of these references would fail to teach applicant's claimed invention.

Next, the Examiner relies upon Qiu, Cheng and Sumi to teach the ratio of the thickness of piezoelectric film to the average cross-sectional diameter of the columnar grains of the second piezoelectric film. Without conceding this assertion or the merits of combining these references with Murai '708, applicant points out that neither of these references individually teach the ratio recited in applicant's claimed invention. During the interview, the Examiner confirmed that he was relying upon a thickness measure from one reference and a cross-sectional diameter from a different reference. Applicant strongly contends that even one skilled in the art would not form a particular ratio of two parameters by drawing one parameter each from two different references. The key to supporting any rejection under 35 U.S.C. §103 is the clear articulation of the reasons

why the claimed invention would have been obvious. *KSR International Co. v. Teleflex Inc.* 82 USPQ2d 1385, 1396 (2007). In this case, the Examiner's rationale does not support pulling two arbitrary dimensions from two different references to form the claimed ratio. The Examiner's supervisor seemed to agree it would be difficult to maintain this rejection on this basis. Therefore, applicant contends a *prima facie* case of obviousness has not been established.

Lastly, the piezoelectric element comprising claimed crystal structure has technical property that the film is prevented from falling off when a high voltage is applied (e.g., see [0028] of the Pre-Grant Publication of the present patent application, US2006/0170736A1). In detail, the piezoelectric element of the present invention does not come off and cracks are not caused even when a high voltage 0 to -80V is applied between the first electric film and the second electric film (see [0218], [0225], [0232], [0239], and [0246]) in order to obtain large actuator displacement, while a comparative piezoelectric element not comprising the claimed crystal structure comes off and cracks are caused when the high voltage is applied (see [0256] and [0265]). None of the cited reference discuss what voltage is applied between electrodes. In this case, the combination of the cited reference does not yield a predictable result. Rather, applicant's claimed crystal structure has a technical property not anticipated from the teachings of the cited references. For this additional reason, applicant asserts that a *prima facie* case of obviousness has not been established.

Therefore, it is respectfully submitted that each of the independent claims, along with claims depending therefrom, defines patentable subject matter over this

combination of references. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested.

If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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